Terrorism and Political Violence

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/ftpv20

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Published online: 21 Dec 2007.

To cite this article: Richard Clutterbuck (1993) Trends in terrorist weaponry, Terrorism and Political Violence, 5:2, 130-139, DOI: 10.1080/09546559308427213

To link to this article: http://dx.doi.org/10.1080/09546559308427213

Trends in Terrorist Weaponry

RICHARD CLUTTERBUCK

It has long been feasible for terrorists to acquire the means of using nuclear, biological and chemical weapons, but they are complex and hard to control and the threat to fire them may lack credibility. Amongst conventional weapons, hand-held missiles have brought about the greatest changes in terrorist tactics, but they are expensive so they need rich sponsors. Small arms have changed very little: the 1884 Maxim gun fired 13 rounds per second; so do the Armalite and the AK74. Submachine-guns have become smaller and lighter and about 150 models, some old but still serviceable, are available worldwide at very low cost. There is, however, no limit to ingenuity in improvising bombs, grenades and mortars, fired by readily available commercial radio-control and timing devices. These are likely to continue to cause most of the surprises as they are difficult to predict.

Nuclear, Biological and Chemical Weapons

A determined and sophisticated terrorist group could almost certainly acquire or assemble a nuclear, biological or chemical (NBC) weapon. This capability has been available for many years but has not thus far been used by terrorists, either for an attack or for a credible hoax (the only hoaxes so far have been quickly identified as such). Why was this so? And is the use, or threat of use, of nuclear weapons more likely in the future?

It is quite feasible – albeit requiring knowledge, skill and the necessary materials – to make a nuclear device in a laboratory. A US research student proved this some years ago. He did his experiments with a high sense of responsibility, in full co-operation with his supervisor, carrying out each individual process, but not in the order which would have produced a nuclear weapon. Some materials, including the nuclear materials, would not be impossible to acquire in small quantities, probably without detection, given a modicum of skill in planning, smuggling and deception.

Another means of acquiring a nuclear device was described by Frederick Forsyth in a fictional setting in his 1984 book *The Fourth Protocol*, in which a team in the Soviet Embassy, supplied by diplomatic bag from the USSR, assembled bit by bit the components and materials required, consignments being small and infrequent enough not to attract attention. Frederick Forsyth does the most meticulous research for his books and, though complicated, (and regardless of whether the USSR would ever have wished to have embarked on it), the project was almost certainly feasible.

The most likely scenario for terrorist use of a nuclear weapon would be to secrete it in one of several crates or containers packed with, say, automobile parts being consigned by sea to the target country. The device would be tracked and in due course fired by radio. When the ship arrived, the terrorist team would telephone a message, the gist of which would be: 'there is a nuclear bomb in the hold of a ship in one of your ports. Unless you agree to our demands by 12 noon tomorrow, we will detonate it.' They would, however, probably be reluctant to carry out the threat, since mass casualties are usually counterproductive. Operations such as blowing up the Air India flight over the Atlantic in 1985 (329 killed), or Pan Am 103 over Lockerbie in 1988 (270 killed) have been very rare, and have achieved nothing for their causes.

A nuclear explosion in a sea port would be even more counterproductive. If the government refused to comply with the demand, the terrorists would probably not detonate the bomb, and both sides would be aware of that. The operation would be flawed on three counts: control, complexity and credibility. Feasible as it is, it is harder to control the course of events, and much more complex to mount than, say, a kidnap, a threat to assassinate or a threat to bomb, using simple hand weapons or improvised grenades; so it is more likely to go wrong, and its perpetrators more likely to be detected; and the threat (of overkill) is less credible.

Biological warfare has been feasible for hundreds of years and was, for example, used in times of plague in the Middle Ages, by catapulting diseased corpses into besieged cities. But it has not been used in modern times, because the perpetrators would have even less control of the consequences.

Chemical weapons are also notoriously difficult to control, because gases drift with changes of wind and persist in unexpected places, whether they are fired in shells, dropped in bombs or, say, released by blowing up a storage tank of highly toxic liquid gas (one of the many regularly used in industry) up wind of a big city.

These arguments against terrorist use of NBC weapons will remain.

Their future use is neither more nor less likely than in the past. It remains feasible, however, so it is necessary still to maintain precautions against it, and contingency plans for crisis management in case the threat does materialise.

Of higher priority, however, is security against the more conventional terrorist weapons; guns, bombs, hand-held missile launchers and improved weapons, including mortars, grenades, mines and bombs.

Small Arms

The **Maxim** gun (1884), the first fully automatic machine-gun, fired 13 rounds per second (rps), and became the British **Vickers** machine-gun, one of the queens of the battlefield in the First World War. The US-made **Armalite** rifle (1960s), used in Vietnam and Northern Ireland, had not increased the rate of fire at all – still 13rps; its bullets were half the weight and, in some people's view, had half the stopping power. The same applied to the Kalashnikov **AK74** (1970s), a smaller calibre version of the **AK47** (1957) – perhaps the most widely used of all terrorist weapons.

An attempt at a quantum leap was made in the late 1980s, with the German-made Heckler & Koch **G11 Assault Rifle**. This fired a bullet a quarter of the weight of the Vickers .303in bullet. (The calibres were: Maxim/Vickers 7.62mm; Armalite 5.56mm; G11 4.7mm). The G11's normal rate of fire was slightly slower (10rps) but it had an ingenious loading and firing mechanism, using caseless ammunition (no cartridge to eject) which, as an alternative to normal automatic fire, offered a 3-round burst, which shot three rounds out of the barrel in one tenth of a second (a cyclic rate of 30rps) during the recoil – that is, before the firer felt any kick on his shoulder, so that these three rounds were very tightly grouped. The German Army, however, has not so far accepted the gun, so, after more than a century, the quantum leap in design, accuracy, rate of fire and reliability in the rifle and machine-gun field has still not taken place. Nor does it seem to be on the horizon.

In the submachine-gun field, since the reign of the **Tommy Gun** (1920s), the chief change has been in miniaturisation. The US-made Tommy Gun was 810mm (32in) long and weighed 5.37kg loaded. Steyr's 9mm **Tactical Machine Pistol** (TMP), undergoing user trials in 1993, has a high performance and is 282mm long; even smaller is the US Commercial **Ingram** (1950s), a favourite terrorist weapon, which is only 222mm (9in) long, and weighs 2.10kg loaded. Most submachine-guns fire 9mm ammunition, which has good stopping power at short range, the bullet being twice the weight with half the muzzle velocity of the 5.56mm Armalite bullet.

The all plastic pistol, with plastic bolts, springs and bullets, has been made, but has attracted few buyers. The plastic bullet is lethal at very short ranges (e.g., as in the hijacked aircraft), but has so far been rarely used except for training. Hijackers who want to smuggle a plastic gun on board an aircraft seem to prefer a replica weapon, which generally achieves the same object, and would get them into less trouble if it were found during their boarding search.

The chief problem from the anti-terrorist viewpoint is the proliferation of submachine-guns. *Jane's Infantry Weapons* lists 150 models, and they can be picked up worldwide at around $35.

Pistols, like rifles and machine-guns, have produced no fundamental advances. Ingenious ideas have appeared and faded away. Terrorists, criminals and policemen regularly turn back to the models essentially the same as those used in the Second World War, or even the First.

Shotguns (often adapted with shortened barrels for easier concealment) are devastatingly lethal up to 40 metres range, with a one metre spread. Pump action or fully automatic shotguns have a greatly increased rate of fire. Nevertheless, terrorists generally prefer smaller and more easily concealed weapons.

Hand Launched Missiles

Free flight missiles, such as the rocket-propelled grenade **RPG 7**, have been supplied to the IRA by Libya and other Arab countries formerly armed by the USSR. The IRA use them against buildings and armoured vehicles. They are usually effective only at short ranges, and if they strike a glancing blow, they are deflected without penetrating the target.

Guided surface-to-surface missiles (SSMs) are much more effective but also very expensive. For this reason, they are only likely to be found cost effective by terrorist movements with unlimited funds like the Palestinians and some other movements supported by oil states. The commonest current anti-tank models are the NATO **Milan** or its Russian equivalent, the **AT4**. The theoretical range is about 3000 metres but, against a small moving target, such as an armoured limousine, the maximum effective range is 2000 metres, with a flight time of about 12 seconds. The missile is wire-guided, so the operator has to pick a firing point from which he can see the road on which the target will be for the distance it is likely to drive in a little over 12 seconds – say about half a kilometre. Having launched the missile, he has only to keep the cross-hairs of his telescopic sight on the target, and the guidance system should ensure a hit. The launcher and missile will all fit into the boot of a car.

Developments are mainly in the guidance systems, including some models with heat-seeking or radar-guided missiles. These changes do not seem likely to make them much more attractive or cost effective for terrorists than the Milan or the AT4.

Surface-to-air missiles (SAMs) are much more attractive to terrorists and have been used to shoot down both civil airliners (e.g., in Rhodesia) and military helicopters (e.g., in Afghanistan). All modern marks are 'fire-and-forget' weapons – that is, – the guidance system is in the missile. The commonest systems are heat-seeking and radar. As with SSMs, current developments seem unlikely to change their appeal and effectiveness for terrorists, which are very high.

A US organisation tried in 1990 to provide **Stinger** SAMs to the IRA but this was intercepted by the Federal Bureau of Investigation. The USA did provide numerous Stingers to the Mujahedin in Afghanistan from 1986, and these were very effective against helicopters flown first by the USSR and then by the Najibullah government forces. Many remain in the hands of the guerrillas and, as they may not need them for what looks like being a prolonged civil war between them, they may be tempted to raise money by selling them to terrorist movements, perhaps at gift prices to Islamic fundamentalists in Algeria or to Bosnian Muslims.

Mortars

Mortars are valuable weapons for fighting in built-up areas. The small infantry mortar (51mm or 2in) is easily portable with a range of 800 metres. Terrorists, however, more often use improvised multiple mortars for attacking police stations, etc. On 7 February 1991 the IRA made a propaganda splash by landing two mortar bombs close to the British Prime Minister's London residence and Cabinet Room, Number 10 Downing Street, while a Cabinet meeting was in progress.

The normal design is to mount six or more steel pipes on the back of a truck or, as in the Downing Street attack, in a minivan with a gap cut in the roof. In this case, there was also a short delay incendiary device to set fire to the van immediately after the mortars were fired, to destroy forensic evidence.

A recent innovation is to use a photo-flash and slave unit to fire all the mortars at once. Professional photographers use these to fire simultaneous flashes to light the subject from different angles. They are fired by the slave unit when it is activated by the flash when he clicks the camera. The terrorist aims his flash gun at his slave unit from a safe distance to fire the mortars.

Grenades

Nearly all terrorist grenades are improvised. The simplest is the **nail bomb**, used by the IRA for the past 20 years; it is made from a few sticks of commercial explosive bound in tape with a handful of 6in nails, with a 3 or 4-second length of safety fuse.

A more sophisticated IRA weapon is the **drogue grenade**, designed to penetrate army or police armoured landrovers, most commonly by throwing it from a window on to the roof of the vehicle. The charge is plastic explosive packed into a beer can, shaped by a metal cone at the front end to give it the armour-piercing power of a hollow charge. The detonator is embedded in the plastic, and is fired by a rim cartridge. The firing pin is a heavy bolt with a chisel end, which fires the rim cartridge on impact. This bolt, in the safe position, is held by a detent at the top of a tube. The tube is fixed into a wooden block plugged tightly into the top of the can. To use the grenade, the operator first removes a safety pin, but he still clutches a lever lying against the tube, which acts like the lever of a conventional First or Second World War grenade (the 'Mills Bomb'): when released, the lever flies up on a spring and extracts the detent. The firing bolt is now loose, held only by a light spring, as the grenade falls towards its target. When it strikes, the bolt crushes the light spring and falls heavily onto the rim cartridge, firing it. To help the grenade to fly straight, nose first, the firing lever also releases a light plastic drogue, which flies behind the grenade as it falls.

The drogue grenade can also be throw horizontally, but it is then less likely to hit its target squarely. It is most effective when dropped or thrown from above.

A recent alternative is the **limpet bomb**, a few sticks of explosive in a plastic lunch box, fired by a 3-second electronic microswitch, and fitted with a powerful magnet. Typically, this is carried by the pillion rider on a motor-cycle, who places it on the roof of the target car or landrover as he overtakes it in the street. This is an adaptation of the more commonly used bomb fixed magnetically under a car with a delay or tilt fuse (see below).

Road Mines

To catch passing patrols in rural areas, **road mines**, also, are almost always improvised, comprising very large charges of home-made bulk explosive (e.g., made from fertilizer and diesel fuel), with a priming charge of a stick or two of commercial explosive and an electric detonator. They are placed under culverts or in parked vehicles by the

roadside. In the last two assassination attempts by the Red Army Faction in Germany, the charge was on a parked bicycle. The mine is usually fired by an electric cable or radio signal from an observation post providing a covered getaway. Alternatively, it can be fired by a magnetic or photo-electric device (as in the two German bicycle bombs), operated by the target vehicle as it passes, but the device must be made live by a radio signal as the target vehicle approaches.

There are many ingenious alternatives, limited only by the imagination of the designer. One method used by the IRA was to fix a large square laminated 'placard' on the side of a parked van containing the charge. The placard comprised two metal sheets separated by a layer of insulating material a few millimetres thick. The metal sheets were connected to the two ends of a firing circuit, which was instantaneously closed by a rifle bullet fired from 200 yards away, as the target vehicle passed by.

Factory-made military **anti-tank mines** are often used on dirt roads where they can be easily dug in and concealed. They are fired by pressure from a wheel or track, usually of 150kg or more, to prevent them being prematurely exploded by an animal or pedestrian. The Arabs use a lot of these.

Car and Truck Bombs

Car and truck bombs have been used by terrorists worldwide, ever since a truck with a huge charge and a delay fuse was driven into the inner courtyard of the King David Hotel at Jerusalem by Jewish terrorists on 22 July 1946. Currently, those used by Arabs, the IRA and ETA usually contain huge bulk charges of improvised explosives, fired by a radio signal or with a timing device. Islamic fundamentalists seeking martyrdom have sometimes driven them into the heart of a target (e.g., the US Marine Corps base at Beirut airport in 1983), when they have been fired either by the drivers or, more often, by remote radio control, in case the driver is shot by guards. Early 1993 saw increasing use of giant truck bombs containing a ton or more of explosives in city centres, for example in New York, London and Protestant town centres in Northern Ireland. The one in the New York World Trade Center killed 6 people and wounded over 1000.

Anti-personnel mines or **booby traps** are frequently used by terrorists, in the vicinity of culvert or roadside mines or of car or truck bombs, to inflict casualties on police or ambulance personnel coming to rescue the wounded. These may either be buried with light pressure switches, or fired by tripwires across the approaches. Booby traps, fired by a variety of methods – pull or pressure switches or remote control –

are used to catch police investigating a suspiciously parked vehicle, or answering a call to a reported 'crime'. Firemen may also be targets of booby traps or of gunmen lying in ambush.

Another kind of car bomb is that designed to kill the driver of a car when he comes to drive it away – or his passenger. These may be booby traps fired by opening the door, switching on the ignition or depressing the clutch pedal. More commonly, they they are **under car bombs** fixed by a magnet to the chassis under the driver's or passenger's seat, or inside the mudguard (wing). These are usually operated by a **tilt fuse**; this is a small glass or plastic tube, such as is used for packaging medical tablets; the bottom end is closed and contains liquid mercury; at the open end, incorporated in the stopper, are the ends of two wires which are terminals of an electric firing circuit. When the tube is jerked or tilted, the mercury moves up and closes the circuit. If the terrorist desires a strong impulse or jerk to fire it, he will tilt the tube steeply. If it is tilted more gently, it will be more sensitive. So the circuit is closed when the car accelerates or brakes or goes over a bump.

To avoid risk to the terrorist from accidentally jerking the tube, it is customary to include a timing device (electronic or clockwork) so that the circuit does not become live until, say, 20 minutes after the terrorist has set the bomb under the car, to enable him to get clear. A bomb like this can be switched on and slipped under a parked car in a few seconds.

A Growing Use of Electronics in Firing Bombs

Terrorists have made increasing use of radio and electronic devices readily available in the shops: notably the simple mechanisms used for remote control of model aircraft and boats; and the timing devices used to set a video-recorder to record a television programme at a precise time, accurate to one second, many days or weeks ahead. Some timers can be set up to a year in advance.

A precise delay fuse was set by an IRA man who booked a room in the Grand Hotel at Brighton in October 1984, three weeks before the Conservative Party Conference. It was timed to fire a large bomb which he concealed behind a panel in the bathroom in a room above the suites in which the Prime Minister and her Cabinet would be sleeping in the early hours of the morning. It did not kill any Cabinet ministers, though it did kill five other people. The man who attempted this assassination was later caught and convicted after another bomb was found in a London hotel, and plans were captured to set more in London and in 12 seaside resorts, presumably intended to deter foreign tourists from visiting Britain.

Bombs in Aircraft

The Lockerbie disaster in December 1988 proved that a charge of less than 1lb of Semtex explosive, if located close to the fuselage in an unreinforced cargo hold, can destroy an aircraft in flight with the loss of hundreds of lives.

Such bombs are usually fitted with a timing device imposing a delay of at least 30 minutes after take-off, and more often several hours, to ensure that the aircraft reaches its cruising altitude and, where possible, that the bomb explodes over the sea. This happened to the Air India flight which exploded over the Atlantic Ocean, killing 329 people in 1985 so that, unlike the bomb in Pan Am 103 over Lockerbie, it left no forensic evidence.

An alternative, to allow for an unexpected delay in take-off, is to use a barometric device which activates at a little below cruising altitude. If the flight plan includes a substantial time over the sea, the barometric device will probably be used to trip a timing device rather to fire the bomb direct. The fact that the Lockerbie bomb exploded before the aircraft reached the coast suggests that there was no barometric device, and this appears to be borne out by the forensic evidence.

Bombs in aircraft may also be fired by radio signals, but this is less common.

The commonest means of getting a bomb on board an aircraft has been in passengers' checked baggage, which has in the past been inadequately searched. Reconciliation of passengers and their baggage, to ensure that the owner of every bag is on board before take-off, is probably more effective than searching, since suicide bombers are, in fact, rare. The subject of aviation security, including baggage reconciliation, is discussed at some length elsewhere in this volume.

Conclusions

Most of the surprises in terrorist weapons in recent years have been the result of ingenious ideas for improvisation. The exception has been the use of radio control and of precise delay switches like those in video-recorders. These are easily obtained and simple to use. Terrorists generally prefer simple weapons, such as bombs, automatic pistols, submachine-guns and assault rifles, and avoid high tech weapons which are more likely to go wrong. There has in any case been little fundamental change in small arms, which long ago reached a degree of accuracy superior to that of the most skilled user. There is again a notable exception – the handheld guided surface-to-air missile. Most of those

used so far have been of designs of at least five years old, but if these weapons improve, and especially if they become more simple, terrorists are likely to take advantage of these improvements, since helicopters and low-flying aircraft are amongst their most feared enemies. Effective SAMs are, however, very expensive, and terrorists without wealthy backers may think it more cost effective to have hundreds or even thousands of small arms for the same price.

It has been feasible for many years for terrorists to use nuclear, biological and chemical weapons, but they have not done so. The reasons probably lie in the difficulty of making the threat credible and of controlling the effects; also the complexity of the operation in comparison with the use of small arms and improvised mortars, grenades and bombs.

The most effective terrorist surprises have usually been achieved with improvised weapons in which there is no limit to imagination in design. This trend is certainly the likeliest to continue.